User Guide

Trimble® Earthworks Training Simulator User Guide

Version 2.19.x
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Trimble

Contents

1

Quick start instructions

This section describes the easiest way to begin using the Trimble® Earthworks simulator: running both the simulator and an Android emulator on a PC. The emulator runs the Earthworks Operator App.

The installation requires a PC with Microsoft® Windows® 10 (for specifications, see 2.2 Hardware requirements).

To begin using the simulator:

1. Download the simulator from Partners and install the contents on the PC. For more information, see 2.1 Install the Trimble Earthworks simulator software.
2. Download and install the BlueStacks Android emulator. For more information, see 2.3.2 BlueStacks Android emulator.

ATTENTION – If you use BlueStacks for business purposes, you may need to purchase a license. For more information, refer to your organization's Licenses department or go to https://enterprise.bluestacks.com/.

3. Launch the simulator and select a machine type and design. For more information, see 3 Using the simulator.
4. Launch BlueStacks.
5. In BlueStacks, load MachineControlPlugin_*.apk and Launch-Assistant.apk from <simulator folder>*/Android/*. For more information, see 2.3.2 BlueStacks Android emulator.
6. Run the Launch Assistant app to start the Earthworks Operator App.
7. Use 2 Thrustmaster joysticks, a gamepad, or the keyboard to operate the machine. For more information, see 3.6 Operating the machine.

For more detail and other methods of operation (including using a TD5x0 display instead of the Android emulator), or if you experience connection issues, see the following chapters.

2

Setting up the Trimble Earthworks simulator platform

This section describes how to set up the simulator platform. There are several options. The recommended methods are:

- Configuration 1: Run the simulator and the Operator App on a PC (with the BlueStacks emulator).
- Configuration 2: Run the simulator on a PC and run the Operator App on a TD5x0 or BYOD display.

All methods use the same process to install the simulator on a PC.

ATTENTION – Configuration 2 requires the modification of the host PC's Ethernet port settings to use the correct IP address. You must have administrator rights on the host PC to configure an Ethernet port's settings. If you don't have administrator rights on the host PC, you must connect the Ethernet port to a router which is capable of dynamically allocating IP addresses. For information on setting up, and connecting to, a router, refer to the router manufacturer's documentation. For router settings, see Using a router to allocate IP addresses

2.1 Install the Trimble Earthworks simulator software

1. Download the simulator install package *Simulator_Earthworks_2_19_0.exe* from Partners, onto the host PC.

   Note – If you downloaded the install package from the Internet, Windows may display a security warning pop-up. To continue with the installation, click Run.
2. Shut down any currently running instances of the simulator.
3. Run the executable and select a destination directory. The install creates a sub-folder within the destination directory to hold the simulator software, and this folder is named with the version number of the simulator. By default, Windows allows a maximum of 260 characters in a full path name, so to reduce install issues put the install package as close to the root of the destination drive as practical.

   You can have different versions of the simulator installed on the host PC, but you cannot run more than one version at a time.

2.2 Hardware requirements

The table below lists hardware components that may be required:

Component	Recommendations or Requirements
Desktop or laptop PC	To run the simulator, a PC that meets the following specifications is recommended: • 64-bit version of Microsoft® Windows operating system 10 (build 1703 or later) • 8 GB RAM • Dedicated graphics card
Third party Android tablet (BYOD)	The recommended tablet is the Samsung Galaxy Tab S7 (SM-T870, SM-T875 and SM-T876B).
Power supply	To run the TD5x0 display, a power supply that meets the following specifications is required: • 12V DC • 1.5A
USB to Ethernet adapter	Used to provide an Ethernet connector on the host PC or third-party tablet. • Host PC: USB-A adapter • Third-party tablet: – Mini USB adapter. The oldest mobile Android device connector. – Micro USB adapter. The most common mobile Android device connector. – USB-C adapter. The most recent mobile Android device connector. ***Note –*** *For ease of portability, avoid reconfiguring your office LAN Ethernet port.*
Ethernet cables	Used to connect the host PC to the display device or to the router.

Component	Recommendations or Requirements
USB controllers	Used to simplify control of the simulation. These can be joysticks or game controllers. The simulator has been tested with the following controllers: • Thrustmaster T 16000M Flight Stick – PC: allows for the physical configuration of the joysticks for either the left or right hand. • Logitech 963290-0403 Extreme 3D Pro Joystick for Windows: the physical configuration is only for the right hand. • Logitech Wireless Gamepad. • Logitech Gamepad F310. • Microsoft Xbox 360 Controller for Windows.
Router	Used to: • Assign the correct IP addresses for the host PC and the display device, when static IP addresses cannot be set on either device • Connect the simulator to a third-party tablet using Wi-Fi

2.3 Configuration 1: Simulator and Operator App on PC (BlueStacks)

TIP – Before starting the simulator, shut down any other applications running on the host PC that might use the same resources as the simulator. These applications could include softphones and video conferencing tools.

2.3.1 Equipment list

- Desktop or laptop PC (Microsoft Windows 10 build 1703 or later)

2.3.2 BlueStacks Android emulator

The BlueStacks Android emulator enables you to emulate a version of the Earthworks software on your PC to use with the simulator, removing the need for a connected display.

ATTENTION – If you use BlueStacks for business purposes, you may need to purchase a license. For more information, refer to your organization's Licenses department or go to https://enterprise.bluestacks.com/.

Note – The BlueStacks emulator is a third party product, so ongoing compatibility with the simulator cannot be guaranteed. Setting up BlueStacks requires a Google account.

Installing BlueStacks on a Windows 11 PC

On a Windows 11 PC, BlueStacks 5 will install a different version of itself depending on whether the Hypervisor virtualization driver (Hyper-V) is installed on the PC. The version of BlueStacks installed may not be correct for your system. If an incompatible version is installed, BlueStacks reports **Incompatible Windows Settings** on start-up. If you receive this message, try running BlueStacks as an administrator.

- You can enable or disable Hypervisor in Windows 11 by selecting Settings > Apps > Optional features > More Windows features.
- If Hypervisor is installed, you must disable the DNS service with the simulator. See 4.2.1 Simulator DNS Service error.
- For more information, refer to this BlueStacks support article.

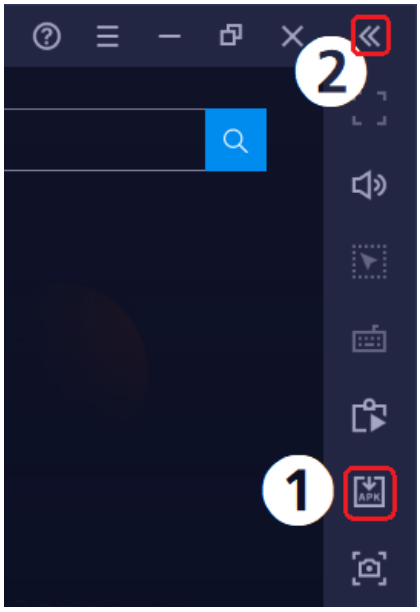
BlueStacks V5 installation procedure

Note – If you use BlueStacks 4, you must select the My games tab to view the desktop.

1. Download and install BlueStacks5 from https://www.bluestacks.com/.
2. Run the simulator on the PC. Proceed through the options until a machine is running in the main screen.
3. Launch BlueStacks.
4. If installed, remove any previous simulator APKs. To do this, select System apps > Settings > Apps.
5. Install MachineControlPlugin_*.apk and launch-assistant.apk from <simulator folder>*/Android/*.

   There are several ways to do this:

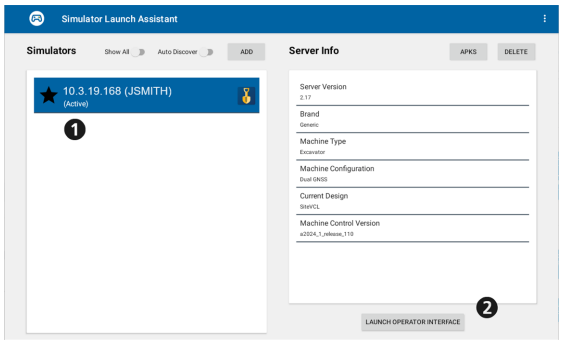
   - Click the APK icon ❶. If the sidebar is not visible, click the >> icon ❷.



- Navigate to the <simulator folder>*/Android/* folder and either double-click on the appropriate APKs or drag-and-drop them onto the BlueStacks desktop. The APKs automatically load in BlueStacks.

Note – The file MachineControlPlugin_*.apk is large and takes some time to install. If it stalls for several minutes, close and re-open BlueStacks. When installed, the Machine Control Plugin does not show on the BlueStacks desktop.

6. Click the Simulator Launch Assistant icon. The Simulator Launch Assistant starts.



   The Launch Assistant shows the available simulator sessions on your network.
7. In the Launch Assistant, select your simulator session from the list on the left ❶.
8. Click the Launch Operator Interface button ❷.
9. If the system requests access permission, grant it.
10. Log in to Trimble Earthworks within BlueStacks and click Start.

TIP – The installation process creates icons on your PC's desktop. Avoid using those icons; use the icons on the BlueStacks desktop to start the Operator App.

For information on how to use BlueStacks with the Payload Management app, see 3.21 LPM demo.

If the Launch Assistant declares a session unreachable shortly after starting, you may need to delete previous Machine Control Plugin apps from BlueStacks. For information, see 4.2.3 Duplicate versions of MachineControlPlugin_*.apk in BlueStacks.

To view BlueStacks support and release notes, go to https://support.bluestacks.com/hc/en-us.

2.4 Configuration 2: Simulator on PC and Operator App on physical display

This configuration requires connecting the PC to a display (either a TD5x0 or a BYOD tablet). It is more complicated than using the PC to run both parts of the system. There are two possible approaches:

- Connect the display to the PC with an Ethernet cable:
  - If the PC can allocate IP addresses, use a direct connection.
  - If the PC cannot allocate IP addresses, connect via a router.
- Connect the display to the PC via Wi-Fi.

ATTENTION – The Ethernet cable method requires the modification of the host PC's Ethernet port settings to use the correct IP address. You must have administrator rights on the host PC to configure an Ethernet port's settings. If you don't have administrator rights on the host PC, you can connect the Ethernet port to a router which is capable of dynamically allocating IP addresses. For information on setting up, and connecting to, a router, refer to the router manufacturer's documentation. For router settings, see Using a router to allocate IP addresses

2.4.1 Equipment list

- Desktop or laptop PC (Microsoft Windows 10 build 1703 or later)
- USB-A Ethernet adapter
- Ethernet cable

Optional equipment for a third-party Android display configuration:

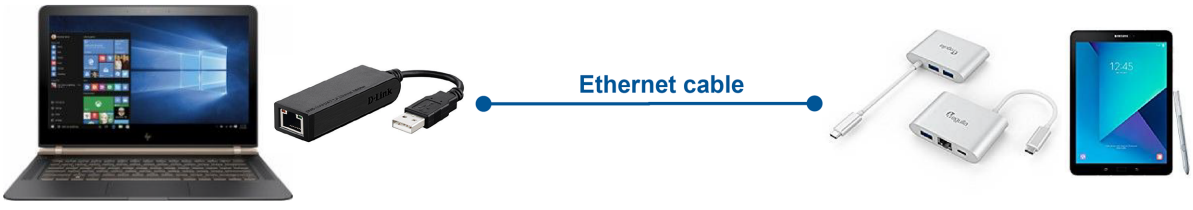
- Third-party Android tablet
- Mini USB, Micro USB, or USB-C Ethernet adapter, as required by your display device

Optional equipment for a TD5x0 display configuration:

- TD5x0 display
- TD5x0 service cable (Trimble P/N 150703-00)
- TD540 adapter cable (for TD540 only, P/N 150878-002)
- Power supply

For information on hardware, see 2.2 Hardware requirements

Example configuration using a third-party Android tablet



Connecting a TD510/TD520 display to the PC

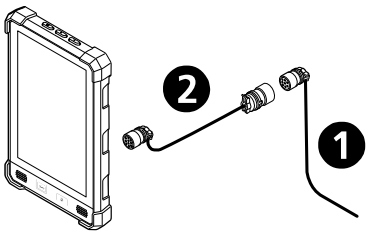
Use a TD5x0 service cable (P/N 150703-00) to connect the TD5x0 display to the simulator PC:

1. Connect the 8-socket plug to the display.
2. Connect the cable's Cat5e socket to an Ethernet cable from the PC.

3. Apply power to the banana plugs.

Connecting a TD540 display to the PC

To connect a TD540 display to the simulator PC, use the TD5x0 service cable (❶), as described above. However, the connector on the TD540 display has 10 sockets, so use the TD540 adapter cable (P/N 150878-002) (❷) to convert the 8-socket plug on the service cable to 10 sockets:



2.4.2 Connecting via Ethernet

Perform the following steps when connecting to the display via Ethernet.

If the PC cannot allocate IP addresses itself, for example, because Administrator mode is not available, include a router in the configuration to provide the IP addresses. See Using a router to allocate IP addresses.

Configuring the host PC (Windows 10)

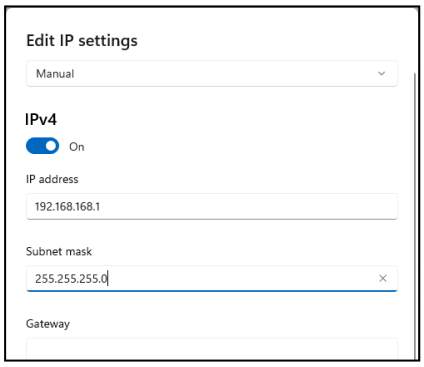
1. Connect the USB-A Ethernet adapter to the host PC. If this is the first time the adapter has been connected, the adapter's driver software loads onto the PC. If the drivers fail to install, refer to the manufacturer's documentation.
2. On the host PC, navigate to Settings > Network & Internet > Ethernet > Change Adapter Options.
3. Select the Ethernet port to configure. Typically, the port is identified by the model of USB Ethernet adapter plugged in, or is the Ethernet port with the highest number.
4. Select Change settings of this connection.
5. Select Internet Protocol Version 4 (TCT / IPv4) from the list of protocols, and select Properties.
6. Select Use the following IP address, and enter the following IP address and subnet mask:
   - IPV4 address: 192.168.168.1
   - Subnet mask: 255.255.255.0

   Once you have configured these settings, the settings will be automatically applied whenever the adapter is connected to the host PC.
7. Start the simulator platform. For more information, see 3.1 Starting the simulator platform

Configuring the host PC (Windows 11)

TIP – When you connect the Ethernet cable, take note of which Ethernet connection displays on the PC's Ethernet dialog. This is the correct one to configure.

1. On the host PC, navigate to Settings > Network & Internet > Ethernet.
2. Connect the USB-A Ethernet adapter to the host PC. If this is the first time the adapter has been connected, the adapter's driver software loads onto the PC. If the drivers fail to install, refer to the manufacturer's documentation.
3. Select the Ethernet port to configure. Typically, the port is identified by the model of USB Ethernet adapter plugged in, or is the Ethernet port with the highest number.
4. Select the Edit button beside IP assignment. The Edit IP settings dialog displays.
5. Set the drop-down to Manual and enable the IPv4 toggle. The available options change.
6. Set the following options:
   - IP address: 192.168.168.1
   - Subnet mask: 255.255.255.0



7. Select Save. Once you have configured these settings, the settings will be automatically applied whenever the adapter is connected to the host PC.
8. Start the simulator platform. For more information, see 3.1 Starting the simulator platform

Configuring the Android display device

USB Ethernet adapter option

1. Connect the Android device:
   - For a third-party tablet, connect an appropriate USB Ethernet adapter to the tablet.
   - For a TD5x0 display, see 2.4 Configuration 2: Simulator on PC and Operator App on physical display for connection instructions.
2. Start the display device.

3. Configure the display device's IP address and network ID. For example, on a TD520 display navigate to Settings > Ethernet > Configure Ethernet:
   - Use static IP addresses (DHCP off)
   - IP address: 192.168.168.2
   - Subnet mask: 255.255.255.0
   - Gateway address: 192.168.168.1
   - DNS address: 192.168.168.1
4. Use the Ethernet cable to connect the USB adapter on the host PC to the USB adapter on the display device.
5. On third-party tablets, open a browser and enter 192.168.168.1 in the address bar. The Web Interface login page displays.

   On TD5x0 displays, tap the Earthworks icon. The Trimble Earthworks launcher runs.
6. As required, install or upgrade the Trimble Earthworks app on the display device.

Wi-Fi connection option

TIP – Skip these steps if the Launch Assistant is already installed on your system.

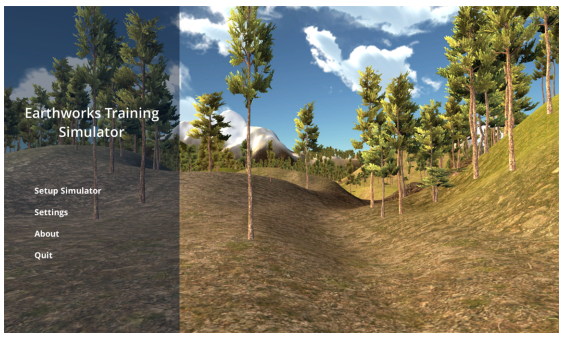
1. Ensure the PC and the BYOD device are connected to the same network.
2. Start the simulator software.
3. Click Get Started and then read and accept the user agreement. The Earthworks Training Simulator screen displays.
4. Click the About button.
5. Record the server address.

6. Open a browser tab on the BYOD device.
7. In the browser address field, enter the Server IP address shown on the simulator About screen followed by the port number: 8864. For the example above, you would enter **10.3.19.28:8864**. A webpage displays listing .apk files.
8. Download the Launch Assistant and install it.

Installing on a TD5x0 or BYOD display

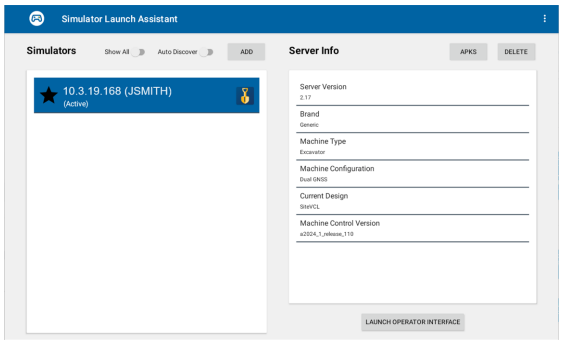
1. Start the simulator from either the Windows Start menu or the desktop icon. The start screen displays.

2. Select the required settings:
   - The Allow Network Discovery checkbox controls whether your simulator session is visible on the local network. If you disable this checkbox, you will need to manually enter the IP address of your session.
   - The Branding drop-down determines the branding that the Operator App displays.
3. Click the Android Folder button to open the folder containing simulator Android package files.
4. Copy the following files from the Android folder to the display:
   - MachineControlPlugin_*.apk
   - launch-assistant.apk
5. Install the 2 APK files on the display.
6. Click Get Started and then read and accept the user agreement. The Earthworks Training Simulator screen displays.



7. Click Setup Simulator and proceed through the setup wizard to the main operating screen.

   On the display, tap the Launch Assistant icon. The Launch Assistant starts.



   If the display is on the same network as the simulator, the Launch Assistant detects the session on your PC.
8. Select your PC from the server list. To bookmark it for future use, click the star icon. Once you have bookmarked your PC, you can disable the Show All toggle so only your PC displays in the list in future.
9. Click the Launch Operator Interface button on the right of the Launch Assistant.

The Operator App starts.

For a TD5x0 display, you can also use the MC Installer app that is part of Earthworks to install the Machine Control Plugin.

Operator App first-time installation

If copying and installing the APK files does not work, use this alternate method to install the Operator App on the Android device.

Before you begin

The Operator App is downloaded onto the display device from the simulator platform. Make sure that:

- The display device is able to install an app from the simulator platform. On the display device, navigate to Settings > Security > Unknown sources, and enable downloading apps from an unknown source.
- The simulator platform is running. For more information, see 3.1 Starting the simulator platform.
- The display device is connected to the simulator platform.

Installing from the Web Interface

To install the Trimble Earthworks app on a display device for the first time:

1. On your display device, open the web browser.
2. Enter 192.168.168.1 into the address bar of the browser. The login screen of the Trimble Earthworks Web Interface displays.
3. Log in to the Web Interface using the following user name and password:
   - User name: admin
   - Password: EarthWorks#1
4. As required, follow any prompts until the Web Interface > Home screen displays.
5. Using the menu on the left side of the Web Interface, navigate to Advanced > Install Operator UI.
6. In the Install App from System ECM panel, tap Install Direct. The Trimble Earthworks installation package downloads to your display device.
7. As required, follow any prompts to install the Trimble Earthworks app. The Operator App login screen displays.
8. Log in to the Operator App using the following user name and password:
   - User name: admin
   - Password: the requirement for a password to access the Operator App is disabled. The requirement for an operator's password is configured using the Web Interface's Home > Machine > User permissions panel.

TIP – Do not change the login name and password for the user *admin*.

Using a router to allocate IP addresses

Perform the following steps when connecting to the display via Ethernet, if the PC cannot allocate IP addresses.

Use a router to allocate IP addresses to the host PC and the display device when you are unable to configure the host and display device's Ethernet ports directly, for example if you don't have administration rights on the host PC or display device.

The software component of a router that allocates the IP addresses and subnet masks is called a Dynamic Host Configuration Protocol (DHCP) server.

1. Log in to the router. For more information, refer to the router manufacturer's documentation.
2. Set the following:
   - Dynamic IP address allocation (DHCP) to on.
   - IP Subnet Mask: 255.255.255.0 – this is the network ID.
   - Starting IP Address: 192.168.168.1 – this is the IP address allocated to the first device to connect to the router.
   - Ending IP Address: 192.168.168.2 – this is the IP address allocated to the last device to connect to the router.
3. Save the settings.

When you start the simulator platform:

1. Start the host PC. The host PC is allocated the IP address 192.168.168.1.
2. Start the display device. The display device is allocated the IP address 192.168.168.2.

2.4.3 Connecting via Wi-Fi

Perform the following steps when connecting to the display via Wi-Fi.

Installing on a TD5x0 or BYOD display

1. Create a Wi-Fi connection between the display and the PC.
2. Start the simulator from either the Windows Start menu or the desktop icon. The start screen displays.
3. Click the Android Folder button to open the folder containing simulator Android package files.
4. Copy the following files from the Android folder to the display:
   - MachineControlPlugin_*.apk
   - launch-assistant.apk
5. Install the 2 APK files on the display.

Operator App first-time installation

If copying and installing the APK files does not work, use this alternate method to install the Operator App on the Android device.

Before you begin

The Operator App is downloaded onto the display device from the simulator platform. Make sure that:

- The display device is able to install an app from the simulator platform. On the display device, navigate to Settings > Security > Unknown sources, and enable downloading apps from an unknown source.
- The simulator platform is running. For more information, see 3.1 Starting the simulator platform.
- The display device is connected to the simulator platform.

Installing from the Web Interface

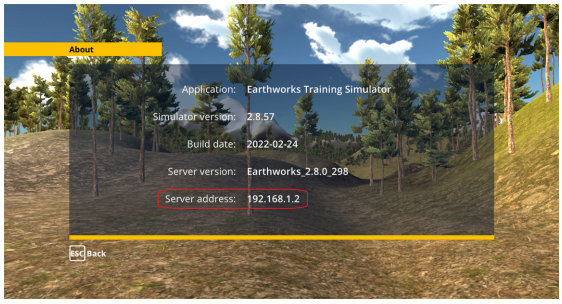
To install the Trimble Earthworks app on a display device for the first time:

1. On your display device, open the web browser.
2. Enter 192.168.168.1 into the address bar of the browser. The login screen of the Trimble Earthworks Web Interface displays.
3. Log in to the Web Interface using the following user name and password:
   - User name: admin
   - Password: EarthWorks#1
4. As required, follow any prompts until the Web Interface > Home screen displays.
5. Using the menu on the left side of the Web Interface, navigate to Advanced > Install Operator UI.
6. In the Install App from System ECM panel, tap Install Direct. The Trimble Earthworks installation package downloads to your display device.
7. As required, follow any prompts to install the Trimble Earthworks app. The Operator App login screen displays.
8. Log in to the Operator App using the following user name and password:
   - User name: admin
   - Password: the requirement for a password to access the Operator App is disabled. The requirement for an operator's password is configured using the Web Interface's Home > Machine > User permissions panel.

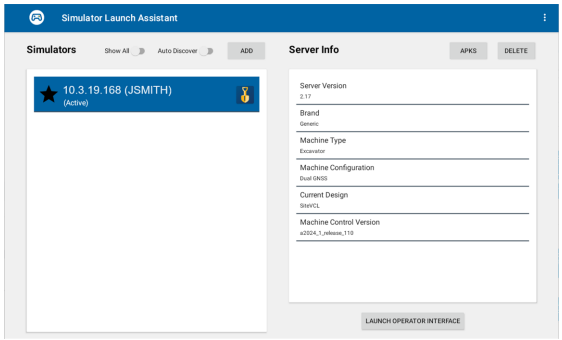
TIP – Do not change the login name and password for the user *admin*.

Configuring the display

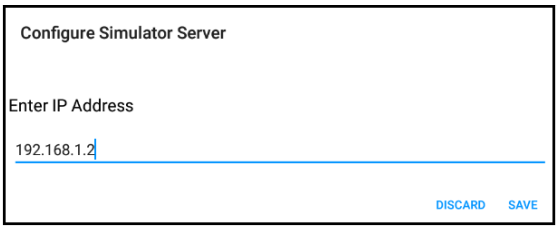
1. On the PC, select your options on the start screen and click Get Started. The simulator's End User License Agreement screen displays.
2. Accept the user agreement.
3. Click About. The About screen displays.
4. Record the Server address (ignoring any numbers after the colon). For example, for the following server address, you would record 192.168.1.2.



5. Press Escape and then click Setup Simulator.
6. Configure a simulation scenario and click Start.
7. On the display, tap the Launch Assistant icon. The Launch Assistant starts.



8. Tap the Add button and enter the Server address listed on the simulator's About screen. Exclude any numbers after a colon.



9. Tap Save. Your simulator session displays in the list on the left of the screen.
10. Select your session and tap Launch Operator Interface. The Operator App starts.

2.4.4 Third party apps

Optional—Sharing the Operator App

There are different options available for mirroring the Trimble Earthworks app to a bigger screen for trade shows or training.

The Vysor app works over a USB cable. You can download it from https://www.vysor.io/.

Optional—Connectify Hotspot 2018

Connectify Hotspot 2018 is an application that enables your PC to act as a virtual Wi-Fi hotspot. You can use Connectify to connect the simulator wirelessly.

The software can be downloaded from https://www.connectify.me/.

3

Using the simulator

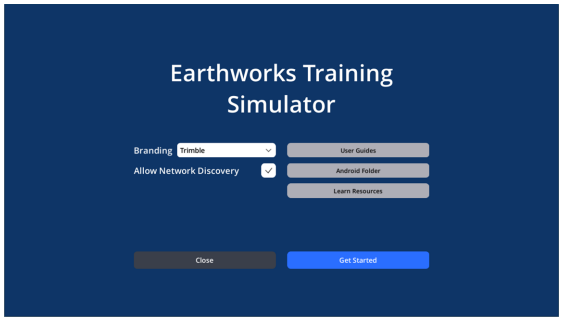
The Operator App starts from the *Launch Assistant* (regardless of whether you are running the app on a TD5x0, BYOD, or Android emulator).

3.1 Starting the simulator platform

TIP – Before starting the simulator, shut down any other applications running on the host PC that might use the same resources as the simulator. These applications could include softphones and video conferencing tools.

To run the simulator platform:

1. Start the simulator from either the Windows Start menu or the desktop icon. The start screen displays:



2. Select the required settings:
   - The Allow Network Discovery checkbox controls whether your simulator session is visible on the local network. If you disable this checkbox, you will need to manually enter the IP address of your session.
   - The Branding drop-down determines the branding that the Operator App displays.
3. Click Get Started.

3.2 Configuring the simulation with the setup wizard

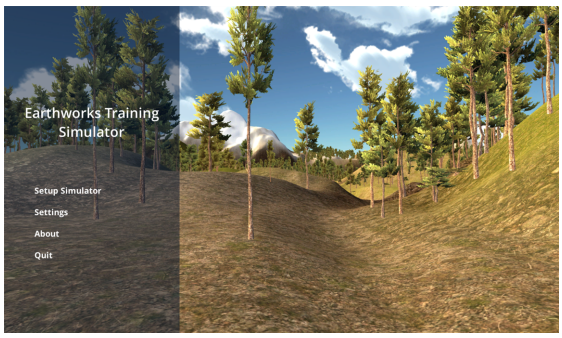
The simulator is configured with the setup wizard. The wizard lets you:

- Select a machine
- Select the license type
- Select the guidance method
- Select the machine branding
- Select a design
- Quit the simulator

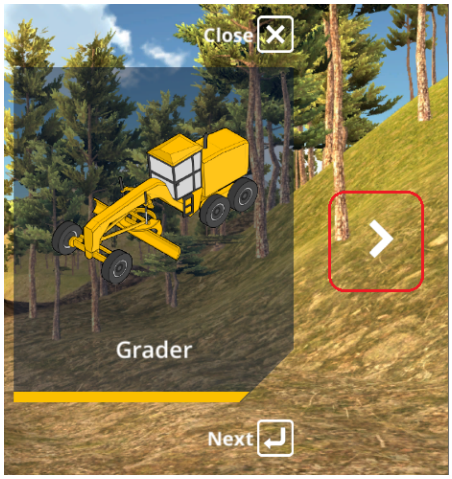
Note – At any time, you can click Quick Launch to skip the rest of the wizard and start the simulator with the settings you have entered. The simulator will select the rest of the settings for you.

Use the simulator wizard to set up a simulation scenario:

1. Read the user agreement and click Accept. The Earthworks Training Simulator screen displays:



2. Click Setup Simulator.
3. Select the machine type and click Next (use the arrow icon or the arrow keys on the keyboard to scroll through the options).



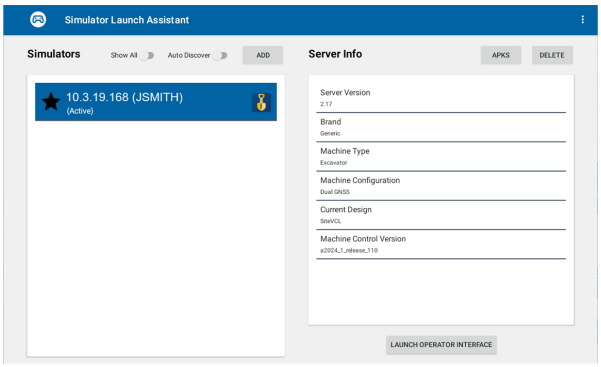
4. Select the license type, guidance configuration, and project.
5. Click Start.

To open the wizard when a simulation is already running:

- Select Menu > Setup from the top left corner of the simulator screen
- Press the Escape key

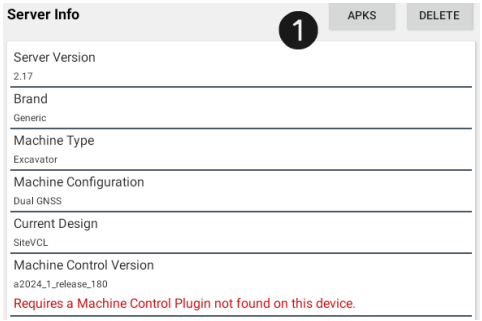
3.3 Starting the Operator App with Launch Assistant

The Launch Assistant starts the Operator App and connects it to the simulator. It lists potential simulator sessions in the list on the left. It tests them for availability and shows the branding.

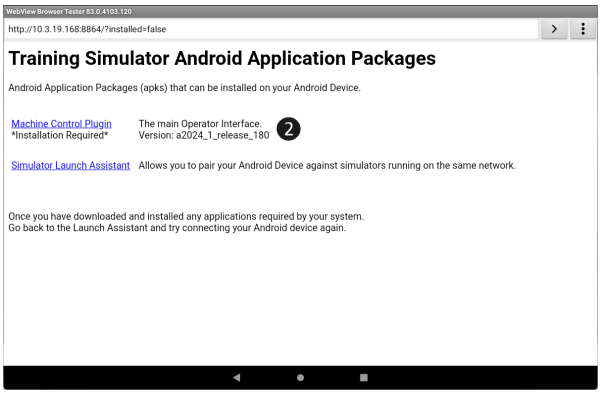


You must install the file MachineControlPlugin*.apk on your display/Android emulator to view the Operator App.

The Launch Assistant checks whether the Machine Control Plugin is installed. If not, it displays a warning.



Click the APKS button ❶ to go to a page with the required APK files ❷.



Note – When it is installed, the Machine Control Plugin does not show on the Android desktop. To delete previous versions of the Machine Control Plugin, go to Settings > Apps.

3.3.1 Additional Launch Assistant options

- Click the star beside a session to tag it so it displays in the list in future:

- The Show All toggle shows all potential sessions on the same network. When disabled, it shows only starred sessions.
- The Auto Discover toggle determines whether the system can detect available sessions on the network.
- The Add button enables you to manually enter the IP address of a simulator session.
- The Del button enables you to remove a session from the list.

3.4 Simulator settings menu

You can adjust the simulator options from the side menu. To expand the menu, press M:

The options are:

Key	Machine	Action
ESC	All	Toggle the setup wizard
M	All	Open/close the side menu
F1	All	Toggle keyboard help
F2	All	Reset the design surface to the unworked state

Key	Machine	Action
F4	Excavator, dozer, grader	Toggle demo mode, see 3.22 Demo mode
F5	All	Load web interface in a browser
F6	All	Engage park brake
F7	All	Open learning materials folder
F8	Grader	Engage float mode
F10	All	Load custom design
F11	All	Open Preferences screen
F12	All	Open settings screen
Tab	All	Toggle camera view For more detail on changing the camera views, see 3.8 Camera views.
Mouse right-click	All	Move machine position on design
ALT + S	All	Save the current scene
ALT + L	All	Load a saved scene
ALT + A	All	Show simulator version information
ALT + Q	All	Close simulator
CTRL + H	All	Show/hide side menu
ALT + P	Dozer, grader, excavator	Configure laser plane
ALT + ENTER	All	Toggle full screen
+	All	Zoom in on external camera views
–	All	Zoom out on external camera views

3.5 Configuring joysticks

The simulator supports using:

- A single joystick (defaults to left-hand side)
- A matching pair of joysticks
- A pair of joysticks from different manufacturers
- Rebinding the joystick controls to different movements

Joystick controls are configured on the Preferences screen:

- For all machines, the joysticks can be swapped between left and right controls.
- For excavators, the control pattern can be swapped between ISO and SAE patterns.

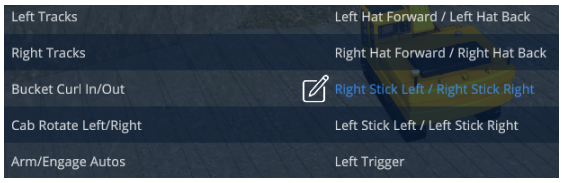
TIP – There is a button on the underside of each Thrustmaster joystick that determines left/right assignment. Ensure this button is correctly set, or the button assignments will differ from those specified.

3.5.1 Rebinding joystick movements

If you want to reassign a joystick action to a machine movement:

1. On the side menu, select Controls.
2. Set the control drop-down to Joystick:

3. Click on the machine action that you want to edit:



4. The Rebinding screen displays:

5. Move the joystick in the new direction.

The simulator records the new joystick movement.

3.5.2 Joysticks not working

If you connect 2 joysticks to the PC's USB ports at the same time while the simulator is running, the system may not recognize them. To avoid this issue, do one of the following:

- Connect the joysticks before starting the simulator
- Insert one joystick and then the other

If the issue occurs, unplug one joystick and then reconnect it.

3.6 Operating the machine

- For keyboard controls, click Keyboard: dozer.
- For joystick controls, click Joysticks: dozer.
- For gamepad controls, click Game controller: dozer.

3.6.1 Keyboard: dozer

Key	Dozer
w	Move forward
s	Move backward
a	Turn left
d	Turn right
SHIFT + w	Move forward (fast)
SHIFT + s	Move backward (fast)
↓	Raise the blade
↑	Lower the blade
→	Tilt blade right tip down
←	Tilt blade left tip down
SHIFT + → or > or ,	Rotate blade (horizontally) clockwise
SHIFT + ← or < or .	Rotate blade (horizontally) counter-clockwise
Spacebar press	Engage Autos
Control	Engage steering control
Page Up	Raise elevation offset
Page Down	Lower elevation offset

3.6.2 Keyboard: excavator

Note – For tiltrotators, the rotation direction reflects looking at the attachment from the cab with the stick in a vertical position and the attachment floor level with the ground.

Key	Excavator (ISO pattern)
All machines	
w	Extend stick
s	Crowd stick
a	Swing left
d	Swing right
z	Swing left (fast)
c	Swing right (fast)
SHIFT + w	Move forward
SHIFT + s	Move backward
SHIFT + a	Turn left
SHIFT + d	Turn right
→	Dump the attachment
←	Curl the attachment
Spacebar hold	Arm Depth Autos /engage Depth Autos
Page Up	Raise elevation offset
Page Down	Lower elevation offset
Additional excavator keys	
↓	Raise the boom
↑	Lower the boom
Additional tiltrotator / tilt bucket keys	
↓	Raise the boom
↑	Lower the boom
q	Tilt attachment: raise left side
e	Tilt attachment: raise right side
Additional tiltrotator keys	
Left Ctrl hold	Arm Tilt Autos / engage Tilt Autos

Key	Excavator (ISO pattern)
Shift + q	Rotate attachment clockwise
Shift + e	Rotate attachment counter-clockwise
Additional swing boom keys	
↓	Raise the boom
↑	Lower the boom
Shift + ←	Move boom position left
Shift + →	Move boom position right
Shift + ↑	Raise the blade
Shift + ↓	Lower the blade
Additional two-piece boom keys	
↓	Raise the lower boom
↑	Lower the lower boom
Shift + ↓	Raise the upper boom
Shift + ↑	Lower the upper boom
Additional two-piece boom + tiltrotator keys	
q	Tilt attachment: raise left side
e	Tilt attachment: raise right side
Shift + q	Rotate attachment clockwise
Shift + e	Rotate attachment counter-clockwise
↓	Raise the lower boom
↑	Lower the lower boom
Shift + ↓	Lower the upper boom
Shift + ↑	Raise the upper boom

3.6.3 Keyboard: grader

Key	Grader
w	Move forward
s	Move backward
a	Turn left

Key	Grader
d	Turn right
q	Lift left blade tip
z	Lower left blade tip
e	Lift right blade tip
c	Lower right blade tip
←	Sideshift blade left
→	Sideshift blade right
↑	Tilt blade forward
↓	Tilt blade back
< or ,	Rotate blade counter-clockwise
> or .	Rotate blade clockwise
Left Ctrl	Engage/disengage left Autos
Right Ctrl	Engage/disengage right Autos
Space	Engage/disengage Sideshift Autos
Insert	Cross slope (2D) –Increase cross slope (when targeting left) by 0.015 m (0.05 US ft) 3D – Raise elevation offset
Delete	Cross slope (2D) – Decrease cross slope (when targeting left) by 0.015 m (0.05 US ft) 3D – Lower elevation offset
Home	Cross slope (2D) – Increase cross slope (when targeting right) by 0.015 m (0.05 US ft) 3D – Raise elevation offset
End	Cross slope (2D) – Decrease cross slope (when targeting right) by 0.015 m (0.05 US ft) 3D – Lower elevation offset
Page Up	2D (cross slope with sonics, or sonics left/right) – Increase cross slope offset (either side) by 0.015 m (0.05 US ft) 3D – Raise elevation offset
Page Down	2D (excluding cross slope with sonics, or sonics left/right) – Decrease cross slope offset (either side) by 0.015 m (0.05 US ft) 3D – Lower elevation offset

3.6.4 Keyboard: soil compactor/landfill compactor

Key	Compactor
w	Move forward
s	Move backward
a	Turn left
d	Turn right
SHIFT + w	Move forward (fast)
Page Up or 9	Increase compaction value (soil compactor only)
Page Down or 3	Decrease compaction value (soil compactor only)
Control	Engage steering control

3.6.5 Keyboard: compact loader

Box blade

Key	Compact loader box blade
w	Move forward
s	Move backward
a	Turn left
d	Turn right
q	Raise left blade tip
z	Lower left blade tip
e	Raise right blade tip
c	Lower right blade tip
Shift + ↓	Raise lift arms
Shift + ↑	Lower lift arms
↓	Pitch attachment plate back
↑	Pitch attachment plate forward
/ (on number pad)	Increase left Autos elevation offset
8 (on number pad)	Decrease left Autos elevation offset
* (on number pad)	Increase right Autos elevation offset
9 (on number pad)	Decrease right Autos elevation offset
Spacebar press	Engage Autos

Grader blade

Key	Compact loader grader blade
w	Move forward
s	Move backward
a	Turn left
d	Turn right
q	Raise left blade tip
z	Lower left blade tip
e	Raise right blade tip
c	Lower right blade tip
Shift + ↓	Raise lift arms
Shift + ↑	Lower lift arms
,	Rotate blade counter-clockwise
.	Rotate blade clockwise
↓	Pitch attachment plate back
↑	Pitch attachment plate forward
/ (on number pad)	Increase left Autos elevation offset
8 (on number pad)	Decrease left Autos elevation offset
* (on number pad)	Increase right Autos elevation offset
9 (on number pad)	Decrease right Autos elevation offset
Spacebar press	Engage Autos

Cat SMART Dozer Blade attachment

Key	Compact loader Cat SMART Dozer Blade attachment
w	Move forward
s	Move backward
a	Turn left
d	Turn right
↑	Pitch attachment plate forward
↓	Pitch attachment plate back
←	Tilt blade right tip up
→	Tilt blade right tip down
,	Rotate blade (horizontally) counter-clockwise
.	Rotate blade (horizontally) clockwise
Shift + ↓	Raise lift arms
Shift + ↑	Lower lift arms
Spacebar press	Engage Autos

3.6.6 Keyboard: large wheel loader

Key	Wheel loader
w	Move forward
s	Move backward
a	Turn left
d	Turn right
↓	Raise lift arm
↑	Lower lift arm
←	Curl attachment
→	Dump attachment

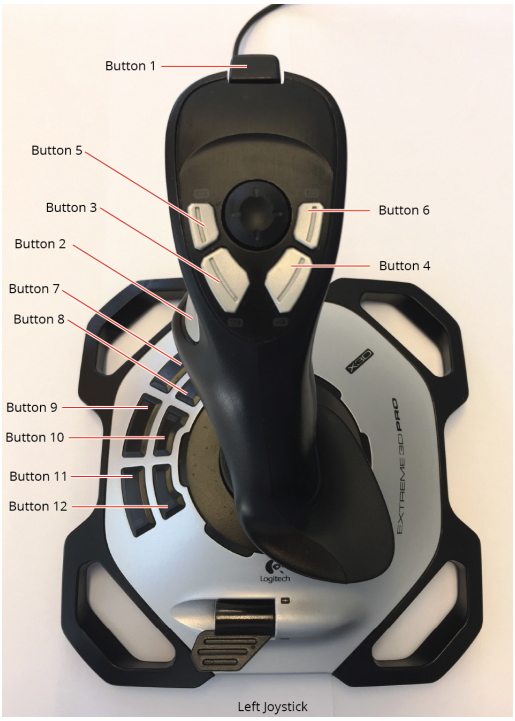
3.6.7 Joysticks: dozer

The following image shows the buttons on the Thrustmaster joysticks:

Left Joystick

Right Joystick

The following image shows the buttons on the Logitech Extreme 3D Pro joysticks:



Left Joystick

The right joystick has the same layout.

Hand	Action	Dozer
Left	Forward	Move forward
	Back	Move backward
	Left	Turn left
	Right	Turn right
	Trigger pull + direction	Increase speed
	Center thumb button (2)	Engage steering control
Right	Forward	Lower blade
	Back	Raise blade
	Left	Tilt blade left tip down
	Right	Tilt blade right tip down
	Twist joystick clockwise	Rotate blade clockwise
	Twist joystick counter-clockwise	Rotate blade counter-clockwise
	Trigger pull	Engage Autos
	Right thumb button (17)	Raise elevation offset
	Left thumb button (31)	Lower elevation offset

3.6.8 Joysticks: excavator

Hand	Action	Excavator (ISO pattern)
Left	Forward	Extend stick
	Back	Crowd stick
	Left	Swing left
	Right	Swing right
	Thumb stick forward/back	Drive left track forward/back
	Trigger hold	Arm Depth Autos / engage Depth Autos
	Twist joystick counter-clockwise	Tiltrotator – rotate attachment clockwise
	Twist joystick clockwise	Tiltrotator – rotate attachment counter-clockwise

Hand	Action	Excavator (ISO pattern)
Right	Forward	Excavator and tiltrotator – lower the boom Two-piece boom – lower the lower boom
	Back	Excavator and tiltrotator – raise the boom Two-piece boom – raise the lower boom
	Left	Curl attachment
	Right	Dump attachment
	Thumb stick forward/back	Drive right track forward/back
	Trigger hold	Tiltrotator – arm Tilt Autos / engage Tilt Autos
	Twist joystick counter-clockwise	Tiltrotator / tilt bucket – tilt attachment: raise left side
	Twist joystick clockwise	Tiltrotator / tilt bucket – tilt attachment: raise right side
	Center thumb button (18) + Forward	Two-piece boom – lower the upper boom
	Center thumb button (18) + Back	Two-piece boom – raise the upper boom
	Left thumb button (31)	Lower elevation offset
	Right thumb button (17)	Raise elevation offset

3.6.9 Joysticks: grader

Hand	Action	Grader
Left	Forward	Move forward
	Back	Move backward
	Left	Turn left
	Right	Turn right
	Thumb stick forward	Raise left blade
	Thumb stick back	Lower left blade
	Trigger	Engage left Autos

Hand	Action	Grader
Right	Forward	Tilt blade forward
	Back	Tilt blade back
	Left	Sideshift blade left
	Right	Sideshift blade right
	Twist joystick counter-clockwise	Rotate blade counter-clockwise
	Twist joystick clockwise	Rotate blade clockwise
	Thumb stick forward	Raise right blade
	Thumb stick back	Lower right blade
	Trigger	Engage right Autos
	Center thumb button (18)	Engage Sideshift Autos

3.6.10 Joysticks: soil compactor/landfill compactor

Hand	Action	Compactor
Left	Forward	Move forward
	Back	Move backward
	Left	Turn left
	Right	Turn right
	Trigger	Move forward (fast)
	Front right button on right of joystick (5)	Decrease compaction value (soil compactor only)
	Back right button on the right of the joystick (6)	Increase compaction value (soil compactor only)
	Center thumb button (2)	Engage steering control

3.6.11 Joysticks: compact loader

Box blade

Hand	Action	Compact loader box blade
Left	Forward	Move forward
	Back	Move backward
	Left	Turn left
	Right	Turn right
	Thumb stick forward	Raise left blade tip
	Thumb stick back	Lower left blade tip
	Left top thumb button (15)	Increment left elevation offset
	Right top thumb button (1)	Decrement left elevation offset

Hand	Action	Compact loader box blade
Right	Forward	Pitch attachment plate forward
	Back	Pitch attachment plate back
	Trigger	Engage/disengage Autos
	Thumb stick forward	Raise right blade tip
	Thumb stick back	Lower right blade tip
	Left top thumb button (31)	Increment right elevation offset
	Right top thumb button (17)	Decrement right elevation offset
	Thrustmaster: • Front right button on right button pad (21) • Front center button on right button pad (20) Extreme3D: • Button 10 • Button 11	Lower lift arms
	Thrustmaster: • Rear right button on right button pad (22) • Rear left button on the left button pad (11) Extreme3D: • Button 12	Raise lift arms

Grader blade

Hand	Action	Compact loader grader blade
Left	Forward	Move forward
	Back	Move backward
	Left	Turn left
	Right	Turn right
	Thumb stick forward	Raise left blade tip
	Thumb stick back	Lower left blade tip
Right	Forward	Pitch attachment plate forward
	Back	Pitch attachment plate back
	Trigger	Engage/disengage Autos
	Thumb stick forward	Raise right blade tip
	Thumb stick back	Lower right blade tip
	Twist joystick	Rotate blade
	Thrustmaster: • Front right button on right button pad (21) • Rear left button on left button pad (27) Extreme3D: • Button 10 • Button 11	Lower lift arms
	Thrustmaster: • Rear right button on right button pad (22) • Front center button on right button pad (20) Extreme3D: • Button 12	Raise lift arms

Cat SMART Dozer Blade attachment

Hand	Action	Compact loader Cat SMART Dozer Blade attachment
Left	Forward	Move forward
	Back	Move backward
	Left	Turn left
	Right	Turn right
Right	Forward	Pitch attachment plate forward
	Back	Pitch attachment plate back
	Thumbstick left	Tilt blade right tip up
	Thumbstick right	Tilt blade right tip down
	Trigger	Engage/disengage Autos
	Twist joystick counter-clockwise	Rotate blade (horizontally) counter-clockwise
	Twist joystick clockwise	Rotate blade (horizontally) clockwise
	Thrustmaster: • Front right button on right button pad (21) • Front center button on right button pad (20) Extreme3D: • Button 10 • Button 11	Lower lift arms
	Thrustmaster: • Rear right button on right button pad (22) • Rear left button on the left button pad (11) Extreme3D: • Button 12	Raise lift arms

3.6.12 Joysticks: large wheel loader

Hand	Action	Large wheel loader
Left	Forward	Move forward
	Back	Move backward
	Left	Turn left
	Right	Turn right
Right	Forward	Lower lift arm
	Back	Raise lift arm
	Left	Curl attachment
	Right	Dump attachment

3.6.13 Game controller: dozer

Hand	Action	Dozer
Left	Thumb stick forward	Move forward
	Thumb stick back	Move backward
	Thumb stick left	Turn left
	Thumb stick right	Turn right
	Left shoulder	Rotate blade counter-clockwise
Right	Thumb stick forward	Lower blade
	Thumb stick back	Raise blade
	Thumb stick left	Tilt blade left tip down
	Thumb stick right	Tilt blade right tip down
	Trigger	Engage Autos
	Right shoulder	Rotate blade clockwise
	Button A	Engage steering control

3.6.14 Game controller: excavator

Hand	Action	Excavator (ISO pattern)
Left	Thumb stick forward	Extend stick
	Thumb stick back	Crowd stick
	Thumb stick left	Swing left
	Thumb stick right	Swing right
	D-pad directional	Move in direction
	Trigger	Tiltrotator – arm Tilt Autos / engage Tilt Autos
	Left shoulder	Tiltrotator / tilt bucket – tilt attachment: raise left side
	Button A + left thumb stick forward	Two-piece boom – lower the upper boom
	Button A + left thumb stick back	Two-piece boom – raise the upper boom
	Trigger + left thumb stick left	Excavator – swing left (fast)
	Trigger + left thumb stick right	Excavator – swing right (fast)
Right	Thumb stick forward	Excavator – lower boom Two-piece boom – lower the lower boom
	Thumb stick back	Excavator – raise boom Two-piece boom – raise the lower boom
	Thumb stick left	Curl attachment
	Thumb stick right	Dump attachment
	Trigger	Arm Depth Autos / engage Depth Autos
	Button X	Tiltrotator – rotate attachment counter-clockwise
	Button B	Tiltrotator – rotate attachment clockwise
	Right shoulder	Tiltrotator / tilt bucket – tilt attachment: raise right side

3.6.15 Game controller: grader

Hand	Action	Grader
Left	Thumb stick forward	Raise left blade tip
	Thumb stick back	Lower left blade tip
	Thumb stick left	Turn left
	Thumb stick right	Turn right
	Trigger	Move backward
	Left shoulder	Engage left Autos
Right	Thumb stick forward	Raise right blade tip
	Thumb stick back	Lower right blade tip
	Thumb stick left	Rotate blade counter-clockwise
	Thumb stick right	Rotate blade clockwise
	Thumb stick press	Engage sideshift Autos
	Trigger	Move forward
	Right shoulder	Engage right Autos
	Button X	Sideshift blade left
	Button B	Sideshift blade right
	Button Y	Tilt blade forward
	Button A	Tilt blade back

3.6.16 Game controller: soil compactor/landfill compactor

Hand	Action	Compactor
Left	Thumb stick forward	Move forward
	Thumb stick back	Move backward
	Thumb stick left	Turn left
	Thumb stick right	Turn right
	Trigger	Move forward (fast)
	Left shoulder	Decrease compaction value (soil compactor only)
Right	Right shoulder	Increase compaction value (soil compactor only)
	Button A	Engage steering control

3.6.17 Game controller: compact loader

Box blade

Hand	Action	Compact loader box blade
Left	Trigger	Move backward
	Thumb stick forward	Raise blade left tip
	Thumb stick back	Lower blade left tip
	Thumb stick left	Turn left
	Thumb stick right	Turn right
	D-pad up	Pitch attachment plate forward
	D-pad down	Pitch attachment plate back
Right	Trigger	Move forward
	Thumb stick forward	Raise blade right tip
	Thumb stick back	Lower blade right tip
	Button X	Engage/disengage Autos
	Button A	Raise lift arms
	Button Y	Lower lift arms

Grader blade

Hand	Action	Compact loader grader blade
Left	Trigger	Move backward
	Thumb stick forward	Raise left blade tip
	Thumb stick back	Lower left blade tip
	Thumb stick left	Turn left
	Thumb stick right	Turn right
	D-pad up	Pitch attachment plate forward
	D-pad down	Pitch attachment plate back

Hand	Action	Compact loader grader blade
Right	Trigger	Move forward
	Thumb stick forward	Raise right blade tip
	Thumb stick back	Lower right blade tip
	Thumb stick left	Rotate blade left
	Thumb stick right	Rotate blade right
	Button X	Engage/disengage Autos
	Button A	Raise lift arms
	Button Y	Lower lift arms

Cat SMART Dozer Blade attachment

Hand	Action	Compact loader Cat SMART Dozer Blade attachment
Left	Trigger	Move backward
	Thumb stick left	Turn left
	Thumb stick right	Turn right
	D-pad up	Pitch attachment plate forward
	D-pad down	Pitch attachment plate back
Right	Trigger	Move forward
	Thumb stick forward	Tilt blade right tip up
	Thumb stick back	Tilt blade right tip down
	Thumb stick left	Rotate blade (horizontally) counter-clockwise
	Thumb stick right	Rotate blade (horizontally) clockwise
	Button X	Engage/disengage Autos
	Button A	Raise lift arms
	Button Y	Lower lift arms

3.6.18 Game controller: large wheel loader

Hand	Action	Dozer
Left	Thumb stick forward	Move forward
	Thumb stick back	Move backward
	Thumb stick left	Turn left
	Thumb stick right	Turn right
Right	Thumb stick forward	Lower lift arm
	Thumb stick back	Raise lift arm
	Thumb stick left	Curl attachment
	Thumb stick right	Dump attachment

Note – If a game controller does not work properly, check to see if it has a control pattern selection switch, and that the switch is set correctly. For example, there is a switch on the back of the Logitech game controller to select either XInput or DirectInput mode.

3.7 Using the Cat 07 excavator

When the simulator branding is set to Caterpillar, the Cat 07 excavator is available (with and without an aftermarket tiltrotator attachment).

This machine is a Cat 07 excavator using Trimble Autos. Because part of the configuration for these machines is performed on the Caterpillar display (which is not available in the simulator), depth Autos is already armed.

To arm tilt Autos on the Cat 07 model with the tiltrotator:

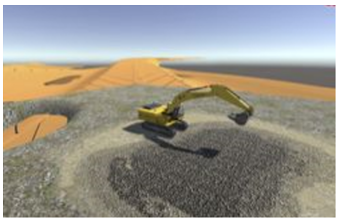
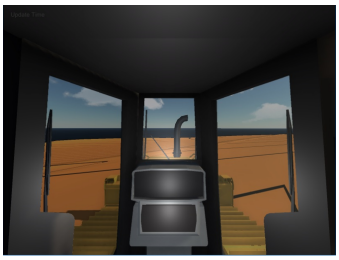
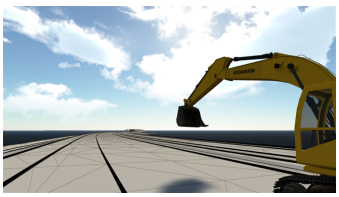
1. Open the Autos Setup screen.
2. Enable the Arm Tilt Autos toggle.

To activate Autos on the Cat 07 excavator:

- Depth Autos – press and hold space
- Tilt Autos – press and hold left Control

3.8 Camera views

Different camera views are available on the main screen. You can show up to 3 views at once:

View	Machine Support	Example
Orbital	All	
In-cab	All	
Top	All	
Side	All	
Orbital attachment	Excavator	

Using the keyboard and mouse, or joystick, you can change the camera view:

Key or Mouse	Action
• TAB • Joystick button 3	Move to next camera. Pressing TAB also resets any zoom that is applied. If you press TAB or joystick button 3 in multiple monitor mode, the view selection dialog displays.

Key or Mouse	Action
• Double-click left mouse button • Double-press joystick button 3	Reset current view to default position
• Left mouse button+ drag • Joystick button 3 + move joystick	Orbit, look, or pan the current view
• +/- buttons on keypad • -/= buttons on main keyboard • Mouse wheel	Zoom the current camera in and out.

3.9 View overlays

The Preferences screen has a tickbox that can be selected to show the design's lines, if present.

View	Example
No lines	
Show Lines	

3.10 Saving and loading a scene

You can save and re-load the current scene.

To save a scene:

1. Start the simulator and select a machine and scenario.
2. Operate the machine until it is in the position you want to save.
3. Do one of the following:
   - Open the side menu and select Save Scene:

   - Press ALT + S.

   The Save Scene screen displays, showing your scene with a default name:

4. Select the pencil icon to enter a meaningful name for the scene.
5. Click Save.

To load a scene (only available after you have saved a scene):

1. Start the simulator and select a machine and scenario.
2. Do one of the following:
   - Open the side menu and select Load Scene:

   - Press ALT + L.

   The Load Scene screen displays, showing the available scenes:

3. Select the appropriate scene and click Load.

Once you have a saved scene, you can also load it directly from the simulator Start menu.

3.11 Loading custom design files

The Trimble Earthworks simulator V2.19.x enables you to load custom design files, either in .dsz or .vcl format.

The design must be in the correct file structure, in the format in which Business Center – HCE exports the files. Any additional geodata files must be included.

There are several ways to add a design to the simulator:

- On the PC, drag and drop a design file onto the simulator screen.
- On the simulator work screen, press F10 and select the design file.
- Copy your design to <simulator folder>*\bin\earthworks_Duplo\projects* on the PC running the simulator.
- Export your design to the TD5x0 display:
    a. From the Operator App of a Trimble Earthworks system, use the File Transfer option on the System Settings menu to export your designs to a USB drive. The designs are exported to the <root>*:\ProjectLibrary\Projects* folder on the drive. The geodata files are exported to <root>*:\ProjectLibrary\GeoData*.
    b. Insert the USB drive into the USB port on the TD5x0 display. The File Transfer screen displays.
    c. In the Transfer Type field, select Import Files TO Machine.
    d. In the From field, select the source type.
    e. Tap Next. The Import Files screen displays.
    f. Select the files that you want to import.
    g. To start the file transfer, tap Import; to exit the screen without applying any changes, tap Cancel.

Note – To use a custom design, load it from the Operator App on the display. Custom designs do not display beside the default designs in the simulator's setup wizard.

After the design loads, you must restart the Operator App.

To change the location of a machine within a custom design, right-click on a location.

3.12 Loading custom machine files

The simulator can load custom machine files (*.machine) for excavators, dozers, graders, compactors and compact loaders.

Note – The machine file must be signed.

To load a file:

1. Start a simulator session.
2. Drag-and-drop the machine file on the simulator screen.

If the machine file is valid, the simulator renders the machine's outline. The Operator App restarts.

If the machine file is invalid, an error message displays.

When the machine file is loaded, a new option becomes available in the side menu. Select Drive Speeds to alter the speed of machine movements. The options on this dialog differ depending on the machine type.

3.12.1 Simulator retains mapping data for compactor custom machine file

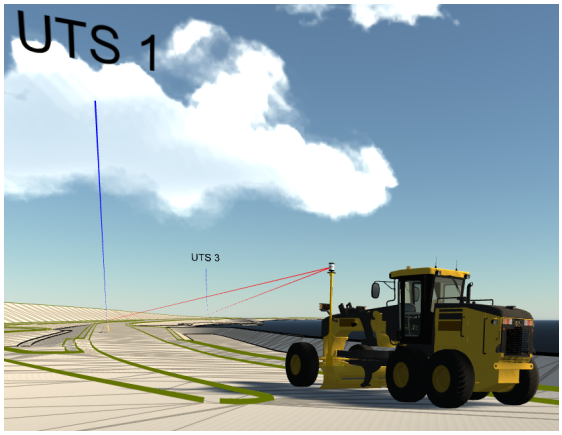
If you load and drive a landfill compactor, and then load a custom machine file for a soil compactor, the simulator retains the mapping data from the landfill compactor for the new machine.

Workaround: After you use the landfill compactor, load one of the standard soil compactor configurations before loading your custom soil compactor machine file. This resets the mapping data.

3.13 Using UTS guidance

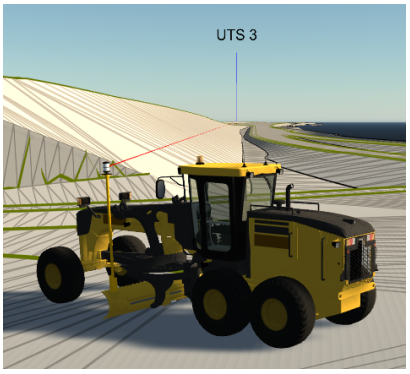
The simulator supports single UTS guidance on graders, dozers, excavators, and compactors using the Overpass design. It shows:

- the locations of total stations with a vertical beam
- the total station ID in the air above it
- the line-of-sight beam between each tracking total station and the machine



- the total station on its tripod

As occurs in reality, when the line-of-sight between the total station and the machine is obstructed by the landscape, UTS guidance is lost.

	
Clear view	Obstructed view

When you start the simulator in UTS mode, the Operator App does not allow you to start navigating. You must first activate the total stations.

To achieve basic UTS operation:

1. Tap the Guidance tile on the Operator App's Dashboard. The Guidance screen displays.
2. Tap the triangle icon beside Setup UTS. The UTS Settings screen displays.

3. Tap Next. The UTS Management screen displays.
4. Tap a total station to make it start searching. When the total station locates the machine, the status changes to Tracking and the line-of-sight beam displays on the simulator.
5. Tap a total station that is tracking to begin using it for guidance.

You can set up to 3 total stations to tracking at the same time, but you can only use a single total station for guidance at a time.

For more information on using UTS with Earthworks, refer to the *Using UTS* guide in the Operator App.

3.13.1 Loading a custom design with UTS

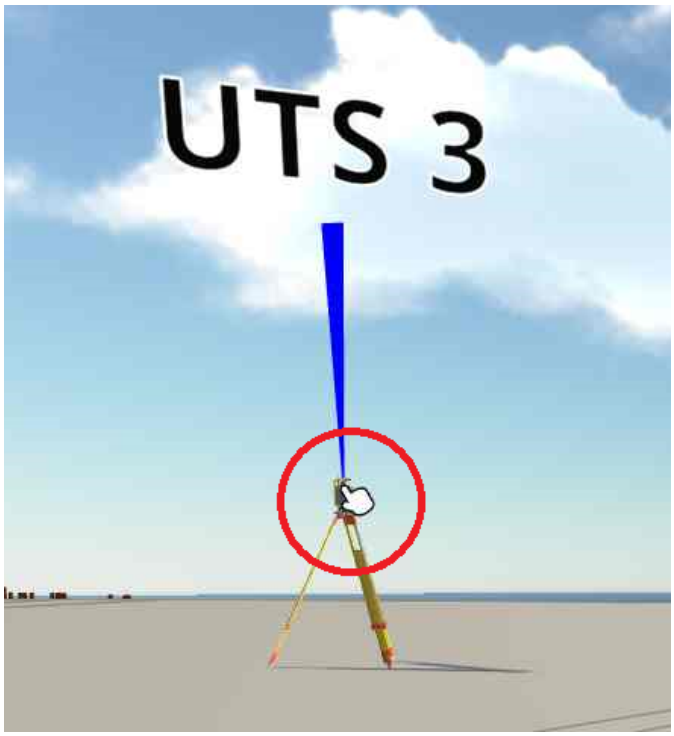
To use UTS with a custom design:

1. Start a simulator session using UTS with the Overpass design.
2. Drag-and-drop the custom design onto the simulator. The custom design loads:
   - It includes one UTS total station near the machine
   - Line-of-sight obstruction is disabled

3.13.2 Moving a tripod

You can adjust the location of UTS tripods. This can be useful if the tripods are poorly situated in custom designs.

1. Hover the mouse over the total station until a finger pointer displays:



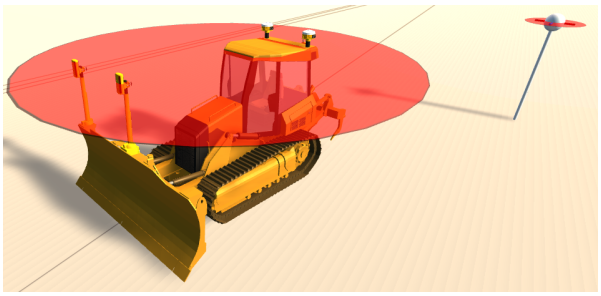
2. Press and hold on the right mouse button.
3. Drag the tripod to a new location and then release the mouse button.

Press F2 to reset the tripod positions.

3.14 Using laser guidance

The simulator supports laser guidance on dozers, graders, and excavators. The simulator shows:

- The location of the laser instrument
- The two laser receivers on the masts
- A disc around the machine that represents the laser plane



When you select Setup Laser from the side menu (or press ALT + P), you can adjust the laser plane's:

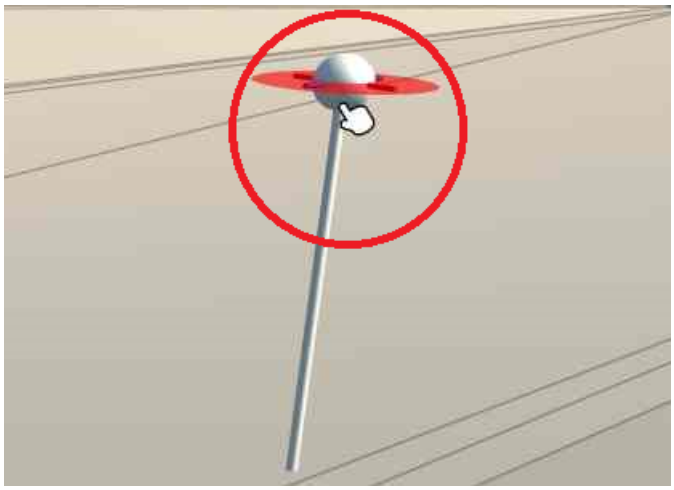
- Height
- Pitch
- Roll
- Visibility

The laser plane is not impeded by geographical features.

3.14.1 Moving the laser transmitter

You can change the location of the laser transmitter. This can be useful if it is poorly situated in a custom design:

1. Hover the mouse over the transmitter until a finger pointer displays:



2. Press and hold on the right mouse button.
3. Drag the transmitter to a new location and then release the mouse button.

Press F2 to reset the position of the transmitter.

3.15 Using sonic tracers

Sonic tracers are available for all grader models. To enable different guidance modes, do one of the following:

- From the Machine Setup screen, change the Guidance Combination.
- From the work screen, press and hold the guidance icon on the guidance bar.

3.16 Compactor machine ECMs

The soil compactor setup includes a screen to select the machine ECM (Bomag, Caterpillar®, or Dynapac):

Machine ECM	Benefits
Cat	Cat machine branding Additional text ribbon items: • MDP • MDP % Change
Bomag	Additional text ribbon items: • Evib • Evib % Change

Machine ECM	Benefits
Dynapac	Additional text ribbon items: • Evib1 • Evib1 % Change • Evib2 • Evib2 % Change
Hamm	Additional text ribbon items: • HMV • HMV % Change

3.17 Dozer/grader interaction with ground terrain

The simulator enables you to interact with the ground terrain when using a dozer or grader.

To use the feature, select a design with a surface terrain (Mountains or Resort):

If the blade digs through the surface, you will see the TIN model underneath.

3.18 Steering control

Soil compactors and dozers support steering control.

To enable it:

1. Select a machine using dual GNSS for guidance.
2. In the Operator App, select Steering Control from the Work Settings menu.
3. Enable the Arm Steering toggle and select Apply.

A disclaimer displays.

4. Read the disclaimer and press the steering control Autos button (Control) to accept it.

   Note – Perform the button press with the simulator screen selected.

5. Touch and hold on the work screen to select a surface.

TIP – On the Mountains design, the FullSite surface has a good selection of lines.

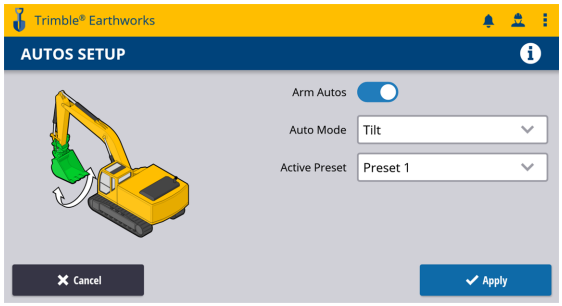
6. Touch and hold on the work screen or use the Horizontal Guidance screen to select a guidance line.
7. Drive the machine near the guidance line and engage steering control (press the Control key). As you drive forward, the machine will steer to follow the line.

3.19 Using excavator tilt Autos

The simulator includes support for VM510 tilt Autos on tilting attachments (such as a tilt bucket).

To enable tilt Autos:

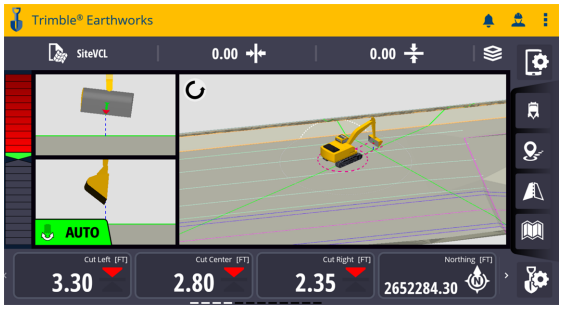
1. In the simulator, select the excavator with the Tilt Bucket.
2. In the Operator App, select the Autos Setup screen from the Work Settings menu.
3. Enable the Autos toggle and set the Auto Mode drop-down to either Tilt or Depth and Tilt:



4. Select Apply.
5. In the simulator, follow the onscreen instructions to calibrate the machine:
   a. Tilt the attachment's left tip upwards.
   b. Press the Autos button (space bar) for 1 second. Tilt Autos is enabled.

To see tilt Autos working:

1. Tilt the attachment to the side.
2. Hold the space bar as you perform a dig. Autos will engage and the attachment will tilt to match the design.

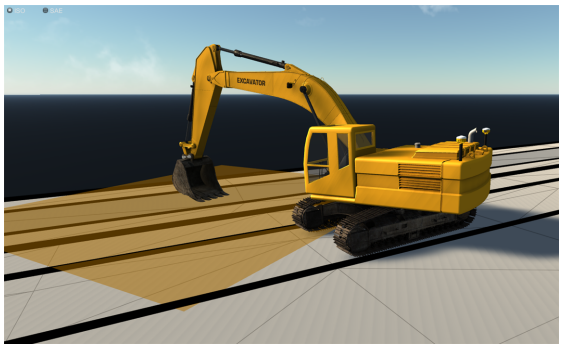


For information on controlling the machine, refer to the *Simulator User Guide*.

3.20 Types of layer visualization

The simulator can show the following visualizations:

- Cross slope / depth and slope planes:



- Infield designs:

- TTM files represented as dirt layers:

3.21 LPM demo

The simulator v2.19.x includes a demo of Payload Management for Earthworks (LPM) functionality. LPM products include machine sensors that enable you to measure the weight of material moved.

The LPM demo includes trucks to hold the material. The ground on this design is interactive. When the truck's bed is full, it drives from the design and an empty truck arrives.

You can run the LPM app on its own in standalone mode, or you can run it within a pane on the Earthworks work screen.

CAUTION — The following procedure is a workaround for advanced users. Successful results are not guaranteed.

Note – The following instructions describe the installation on BlueStacks.

To run the LPM app in standalone mode:

1. Run the simulator and select the excavator configured with LPM.
2. Install the file <simulator folder>*/Android/lpm.apk* in BlueStacks.
3. Select the Loadrite icon.
4. When the app loads, select the button in the bottom left of the app and then select Setup.
5. Enter the access code 726992.
6. Select Advanced.

7. Select EC520 URI and change it from *myec520.com* to *10.0.2.2*
8. Select the back arrow on the sidebar twice.

The app is now operational. In the simulator, dig 3 times to warm up the machine or press F4 to begin the demo.

To run the LPM app within one of the panes on the Earthworks work screen:

1. Run the simulator and select the excavator configured with LPM.
2. Install launcher.apk and launch-assistant.apk as usual. Ensure that you run launcher.apk to grant it permission.
3. Install the file <simulator folder>*/Android/lpm.apk*.
4. Select the Loadrite icon.
5. Grant the app permission to draw over other apps.
6. Select the back arrow on the sidebar. The app closes.
7. On the desktop, select the Loadrite icon again.
8. When the app loads, select the button in the bottom left of the app and then select Setup.
9. Enter the access code 726992.
10. Select Advanced.
11. Select EC520 URI and change it from *myec520.com* to *10.0.2.2*
12. Leave the app running in the background.
13. On the desktop, select the Launch Assistant icon.
14. Select the session 10.0.2.2 (as usual) and select Launch Operator Interface. The Earthworks app loads.
15. Assign the LPM app to display on a view:
    a. Click-and-hold on the Earthworks workscreen.
    b. Select Change View.
    c. Set the largest view to Loadrite.

TIP — The LPM app displays best with the display in portrait mode. In BlueStacks, use the icon on the sidebar to change the display to portrait.

16. In the simulator, dig 3 times to warm up the machine or press F4 to begin the demo.

3.22 Demo mode

You can set the simulator to run in demo mode for excavators, graders, and dozers. The designs that support demo mode are:

Design	Excavator	Dozer	Grader
Mountains	✓	✕	✕

Design	Excavator	Dozer	Grader
Overpass	✓	✓	✓
Resort	✓	✕	✕
Small Site	✓	✓	✓
Suburb	✓	✓	✓

To enter demo mode, press F4. The Demo button becomes green and the text Demo Mode flashes at the bottom of the screen.

For excavators, the demo shows the machine digging.

For graders and dozers, the demo shows the machine driving in a loop with Autos engaged.

You can cycle through camera views in demo mode.

Press F4 again to exit demo mode.

3.23 Accessing the Web Interface

In addition to exploring the Operator Interface with the simulator, you can also access the Web Interface:

- From the simulator side menu, click the Web Interface button:

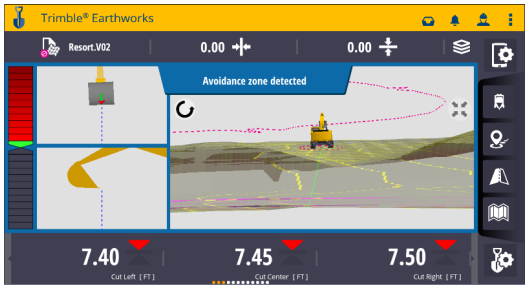
- In the simulator, press F5.
- On the PC, open a browser tab and enter http://localhost

The Web Interface login details are:

- User name: admin
- Password: EarthWorks#1

3.24 Other system features

- The Resort design includes an avoidance zone. The simulator screen displays avoidance zones with a series of red posts:



- The Operator Plus user permission allows access to several configuration options that were previously only available via the Web Interface, for example calibrating an HS410 heading sensor. The simulator user has Operator Plus permission so you can demonstrate these features.
- The simulator supports cut/fill mapping features, including advanced mapping.

4

Troubleshooting

If you cannot resolve the issue with the guidance in this section, contact your support organization.

4.1 Simulator retains mapping data for compactor custom machine file

If you load and drive a landfill compactor, and then load a custom machine file for a soil compactor, the simulator retains the mapping data from the landfill compactor for the new machine.

Workaround: After you use the landfill compactor, load one of the standard soil compactor configurations before loading your custom soil compactor machine file. This resets the mapping data.

4.2 Simulator installation issues

The simulator software components require available network ports to communicate. For more information on the port requirements, see Chapter 5, Simulator system architecture.

4.2.1 Simulator DNS Service error

If you see a system error indicating that the Simulator DNS Service has exited, and you have Hyper-V enabled, disable the DNS Service:

1. Open the simulator's Settings screen (F12).
2. Unselect the checkbox for *Start the Simulator DNS Service*:

3. Restart the simulation.

If you need to use the Earthworks Launcher or MC Installer, this approach does not work. Instead, you must disable Hyper-V. Restart the PC after you disable it.

4.2.2 AR camera requires TD5x0 Ethernet set to DHCP

If you use your TD5x0 display both to show the simulator and in an actual system with an AR camera, be aware that the simulator and the camera require different Ethernet settings:

- Simulator: requires TD5x0 Ethernet set to StaticIP.
- AR camera: requires TD5x0 Ethernet set to DHCP.

When you move the display between the simulator and the actual system, you will need to change the Ethernet setting on the display. Go to Settings > Ethernet > Configure Ethernet and adjust the Connection Type.

4.2.3 Duplicate versions of MachineControlPlugin_*.apk in BlueStacks

When you install the file MachineControlPlugin_*.apk in BlueStacks, the previous version remains. If you experience conflicts (for example, the Launch Assistant defining a running session as Unreachable), go into Google apps and delete the previous versions:

1. On the BlueStacks desktop, expand the System apps folder.
2. Click Android Settings > Apps.
3. If there are multiple versions of Machine Control Plugin, delete them.
4. On the desktop, re-install MachineControlPlugin_*.apk.

4.2.4 Install the simulator on an appropriate drive

It is recommended that you install the simulator on your system drive. Network drives and cloud drives may be too slow.

4.2.5 Avoid clashes with earlier versions

If the simulator is not working correctly and you installed it over a previous version, delete all the files and perform a clean install.

4.2.6 Simulator on Citrix environments

Avoid installing the simulator in a Citrix environment. The Unity engine will not work.

4.2.7 Correct PC to display data cable required

Ensure that you use a standard Ethernet cable (Cat 5 or above) to connect the PC to the TD520 display, and that the cable is connected correctly. A non-standard data cable, such as a crossover cable, may cause the simulator to display unexpected issues like lost guidance or a missing Start button.

4.2.8 Required network port is occupied by another process

The simulator software components require several network ports to communicate. The simulator can fail to work if these ports are occupied by other services. Common services that block ports include:

- World Wide Web Publishing Service (W3SVC)
- SQL Server Reporting Services (MSQLSERVER)

- Other web servers such as Apache/Tomcat or IIS
- Internet Connection Sharing (ICS)
- Other DNS servers

For example, the YAMS Proxy component within Duplo requires port 80. If Duplo is blocked from running by the firewall or because a process occupies the port, the following error message displays: **Duplo: Exited**.

To determine which ports are occupied by processes, use one of the following methods:

- Enter *netstat -ab* at the command line as an administrator. If you do not have administrator permission, contact your IT department.

  Find the service running on TCP 0.0.0.0:80.
- Check if a web server is running:
  a. Open a browser window.
  b. Enter *localhost* in the search bar and press Enter. If a webpage displays, a web server is running.

     Note – If a webpage does not display, it is still possible that a web server is running.

To resolve the port clash, use one of the following methods to disable or uninstall the blocking process:

- If the netstat software reports that the system is occupying port 80, IIS may be running. This is most likely if you are running Windows 7, or have a PC updated from Windows 7. Enter *net stop http* in a command window as administrator. You must repeat this method after each reboot.
- Disable W3SVC:
  a. From the Start menu, enter *services* and open the application (you may need the required permissions to run this program).
  b. Find World Wide Web Publishing Service in the list.
  c. Right-click Properties and then click the Stop button.

     To make this a more permanent solution, change the service's startup type to Manual or Disabled.
- Remove IIS or SQL Server reporting services (if they are unneeded):
  a. From the Start menu, enter *Turn Windows features on or off*.
  b. Disable Internet Information Services.
  c. Restart the PC.

4.2.9 Firewall blocks the applications from communicating

The **Duplo: Exited** error message can also appear if Duplo is blocked from running by the firewall.

Check that the applications can communicate through the firewall. For example, if the LOADRITE demo cannot communicate, the file *Loadrite.exe* may be blocked by your PC's firewall. To enable it:

1. Click the PC's Start button and type "Allow".
2. Select *Allow an app through Windows Firewall*. The Allowed apps screen displays.
3. Click *Change settings*.
4. Click *Allow another app...*
5. Add the file <simulator folder>*/Bin/Earthworks/_Loadrite/Loadrite.exe*.

Your PC's security settings may prohibit this. For help, contact your IT department.

4.2.10 Virus scanner flags the software as unsafe

If your virus scanner flags the software as unsafe, set the virus scanner to allow the applications to run. For help, contact your IT department.

4.2.11 Cannot create a network with a static IP address

If you do not have permission to create a network with a static IP address during the installation process, contact your IT department.

4.3 Simulator operating issues

4.3.1 Changing screen settings causes mouse issues

If you experience issues with the mouse when switching between full-screen mode and windowed mode with multiple displays, restart the simulator.

4.3.2 Multiple quick camera pans can reset the view

If you try to drag the camera view multiple times in quick succession, the system may interpret it as a double-click and reset the view to the default position.

4.3.3 System snapshot returns error message

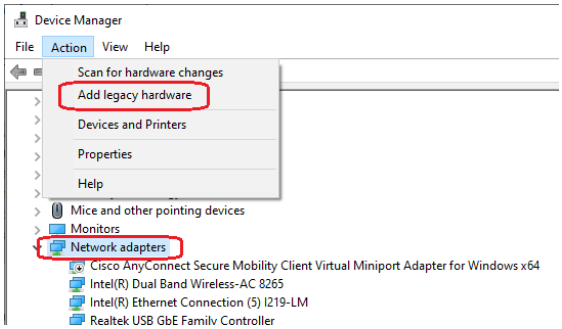
If you take a system snapshot on a simulator setup where the snapshot service is not installed, an error message displays. You can ignore the message.

4.3.4 Using the simulator without an internet connection

If you run the simulator without an internet connection, when you change machine type in BlueStacks, the Operator App crashes.

To resolve this issue, install the software for the Microsoft KM-TEST loopback adaptor card (the card is not required).

1. Right-click on Windows Start menu icon and select Device Manager. The Device Manager displays.
2. Select Network adapters.
3. In the Action menu, select Add legacy hardware.



The Add Hardware wizard displays.

4. Click Next on the welcome screen.
5. Select Install the hardware that I manually select from a list and click Next.
6. Select Network adapters and click Next.
7. Select Microsoft as the manufacturer, and then select Microsoft KM-TEST Loopback adapter card as the model.
8. click Next, twice, and then click Finish.

4.3.5 Joysticks not working

If you connect 2 joysticks to the PC's USB ports at the same time while the simulator is running, the system may not recognize them. To avoid this issue, do one of the following:

- Connect the joysticks before starting the simulator
- Insert one joystick and then the other

If the issue occurs, unplug one joystick and then reconnect it.

4.3.6 Launch Assistant

If your system cannot create a connection between the PC and the display, use the Launch Assistant. The Launch Assistant helps the system to resolve IP addresses. To use the Launch Assistant:

1. Start the simulator as usual.
2. Load the file <simulator folder>*/Android/launch-assistant.apk*.

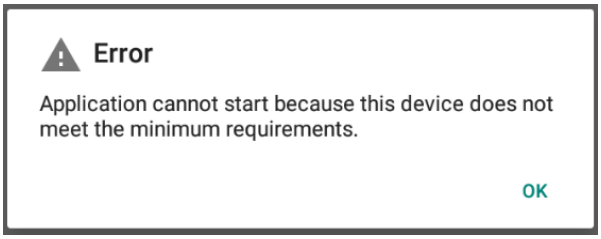
Note – *The Launch Assistant does not correct BlueStacks issues.*

4.3.7 BlueStacks creates icons on PC desktop

If you use the BlueStacks emulator, it installs icons on your PC's desktop. Avoid using these icons to start the simulator. Use the icons on the BlueStacks desktop.

4.3.8 Screen resolution

If you use the BlueStacks emulator, ensure you have the screen resolution set to an aspect ratio of 16:10, for example 1920 x 1200. Failure to do this can cause a message that minimum requirements are not met:



4.3.9 Entry Point Not Found error message

If the simulator reports an Entry Point Not Found error, ensure that your PC's operating system is up to date.

This issue affects Windows 10 build 1607 and lower.

4.3.10 Accessing Web Interface screens from within the Operator App

There are several buttons in the Operator App that enable you to access sections of the Web Interface (for example, editing an attachment or advanced configuration of GNSS). The simulator enables you to access these Web Interface screens, but when you click Exit, the app closes.

4.3.11 Reduced performance on PCs with lower processing capability

On a PC that does not meet the recommended processing capability, the simulator may struggle to run correctly. Symptoms include:

- Guidance Lost message on the Android device
- Required Devices Are Not Configured message on the Android device
- A difference in machine position between the machine model in the simulator guidance window and the machine model on the Android device
- The machine attachment is driven beyond the design surface
- Reduced frame rate

Issues are more likely when:

- The design has movable terrain (you can dig it or leave track marks)
- You are using multiple monitors

You may be able to improve performance by pressing F12 to change to non-3D graphics mode.

4.3.12 Possible DNS connection issues between PC and display

Earlier releases of the simulator used the IP address 192.168.168.1 to connect the PC to the TD5x0.

The simulator now uses the virtual URL myec520.com to locate the EC520 on the network. The simulator now includes a DNS server to resolve that URL to the PC at 192.168.168.1. This requires port 53 to be available.

If there is a connection error, for example because another service is occupying the port, the simulator will appear to start correctly but show a DNS Inactive error.

Services that may occupy the port include:

- ICS (Internet Connection Sharing): usually installed if the PC has been used as a hotspot
- A previously installed DNS server

Free port 53 to enable the simulator to communicate.

4.3.13 Simulator may exhibit instability if run for an extended period

The simulator may display unexpected behavior after running for an extended period of time. To avoid instability, close and restart the simulator application at least once every 24 hours.

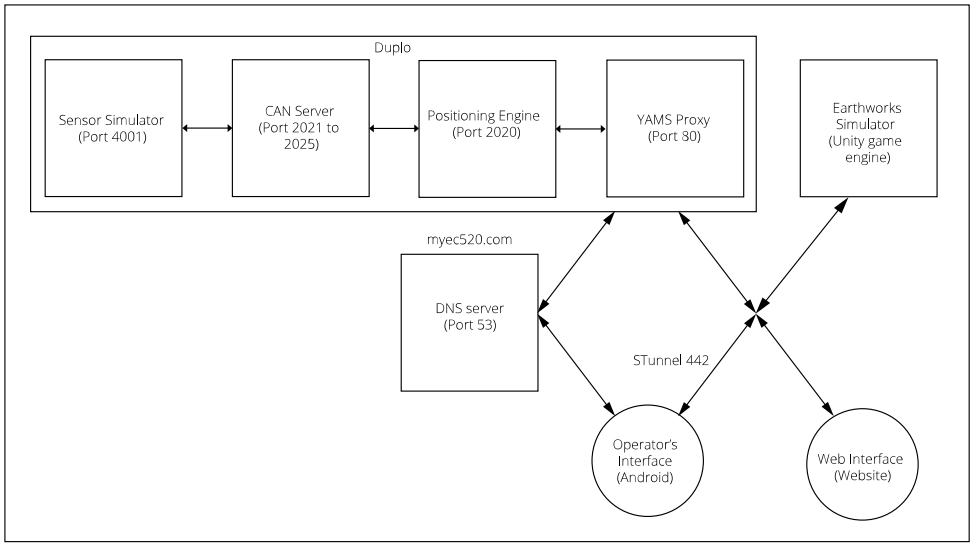
4.3.14 Audible alarm is silent

Simulated AA510 audible alarm sound is not supported.

5

Simulator system architecture

The figure below shows the simulator system architecture.



The required ports are:

System Component	Port Number
CAN server	2021 to 2025
Sensor simulator	4001
Positioning engine	2020
YAMS proxy	80
DNS server	53

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